

THE INVENTION IS DESCRIBED IN THE FOLLOWING CLAIMS:

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- 1 A drill head capable of attachment to a drilling machine for insertion of rock bolts into rock strata; the drill head comprising:
a base block including means to facilitate attachment to said drilling machine;
means for driving a spindle having a member at one end which receives a proximal end of a rock bolt including an internal cavity;
an injection assembly including at least one internal passage for retaining a grouting compound, wherein, when said rock bolt is inserted in said member and when said injection member engages said member, said at least one passage is in communication with said internal cavity in said rock bolt; whereupon said injection assembly operates to inject a predetermined quantity of said grouting compound into a bolt hole in said rock strata via said internal cavity of said bolt.
 - 2 A drill head according to claim 1 wherein said spindle is rotatable and said member which engages said proximal end of said rock bolt comprises a chuck.
 - 3 A drill head according to claim 2 wherein, upon rotation of said spindle said rock bolt also rotates.
 - 4 A drill head according to claim 3 further comprising passages through which a flushing fluid flows and which are in fluid communication with said cavity in said rock bolt.
 - 5 A drill head according to claim 4 wherein the the injection assembly does not rotate but is capable of axial extension and retraction independant of said spindle.
 - 6 A drill head according to claim 5 wherein, said injection nozzle functions as a shut off valve to isolate said flushing fluid from said cavity.
 - 7 A drill head according to claim 6 wherein the injection assembly includes two concentric passages each of which contains a separate grouting material, wherein said passages are

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disposed so as to keep the grouting materials separate until said materials exit said passages and enter the internal cavity in said rock bolt whereupon they mix to form a grouting resin.

8 A drill head according to claim 7, wherein, the grouting resin exits the internal cavity of the bolt via a distal end of said bolt and fills a space between an outer surface of the bolt and a wall of a hole in which the bolt is placed.

9 A drill head according to claim 8 wherein the member for receiving said proximal end of said rock bolt includes a recess which includes a profile which conforms to and engages with a corresponding profile on said proximal end of said bolt to enable mutual rotation of said member with said rock bolt.

10 A drill head according to claim 9 wherein the profile of said recess is hexagonal and receives a corresponding hexagonal external profile formed in said proximal end of said rock bolt.

11 A drill head according to claim 10 wherein said rock bolt is self drilling.

12 A drill head according to claim 11 wherein said injection assembly is capable of movement between a retracted state in which water is capable of entering said cavity of said rock bolt during drilling and an extended state when drilling has ceased in which an end of said injection assembly engages an opening to said cavity thereby allowing the passage of a grouting material held in said injection assembly into said bolt hole via said cavity in said bolt.

13 A drill head according to claim 12 wherein the grouting materials include polyester resins, PVA and epoxy resins.

14 A drill head capable of attachment to a drilling machine for insertion of rock bolts into rock strata, the drill head comprising: a base block including means to facilitate said attachment to said drilling machine:

drive means for driving a spindle having a member which engages a proximal end of a

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rock bolt including an internal cavity;

an injection assembly including at least one internal passage for retaining a grouting material, wherein, when said rock bolt is inserted in said member, said at least one passage is in communication with the internal cavity in said rock bolt; whereupon said injection assembly operates to inject a predetermined quantity of said grouting compound into said internal cavity of said bolt; wherein the drill head further comprises means enabling injection through passages therein of water into a bolt hole to evacuate rock debris from the hole during drilling.

15 A drill head according to claim 14 wherein the injection assembly has two concentric passages each of which contains a separate grouting compound, wherein said passages are arranged so as to keep the grouting compounds separate until the compounds exit said passages and enter the internal cavity in said rock bolt whereupon they mix to form a grouting resin prior to exiting said bolt.

16 A drill head according to claim 15 wherein the grout exits the internal cavity of the bolt via openings in a distal end and is injected until it fills a space between an outer surface of the bolt and the wall of the hole in which the bolt is placed.

17 A drill head capable of attachment to a drilling machine for insertion of a self drilling rock bolt into rock strata; the drill head including:
a sprocket for receiving an end of said rock bolt which includes an internal cavity,
an injection assembly including a passage for retaining a grouting compound and which when said bolt engages said sprocket is placed in communication with said internal cavity of said bolt; wherein the injection assembly injects said grouting compound into the internal cavity of said bolt at least until said compound exits said internal cavity of said bolt and engages a wall of a hole in which said bolt is inserted.

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18 A drill head according to claim 17 wherein, the grouting compound is injected until it fills the space between the exterior of the bolt and the wall of the hole in which the bolt is inserted.

19 A drill head capable of attachment to a drilling machine for insertion of a self drilling rock bolt into rock strata; wherein the head includes an injection assembly adapted to enable injection of a grouting compound from a passage in the drill head and into a bolt hole via an internal cavity in said rock bolt which communicates with said passage in said drill head when an end of said bolt engages said drill head such that said passage and said internal cavity are substantially in alignment.

20 A self drilling rock bolt for insertion in a rock strata and adapted to engage a drilling head capable of attachment to a drilling machine; wherein the rock bolt comprises; a proximal end and a distal end and an internal cavity therebetween: the proximal end having a mating profile which engages a corresponding profiled member on said drilling machine enabling mutual rotation of said bolt and said member during insertion of said bolt, the bolt further including at or near said distal end at least one opening in communication with said cavity for discharging a grouting material delivered to said bolt from said head.

21 A self drilling rock bolt according to claim 20 wherein, when said bolt engages said head, said cavity in said bolt is in general alignment with a cavity in said head containing said grouting material.

22 A self drilling rock bolt according to claim 21 wherein an opening in said proximal end of said bolt receives at least one grouting material which advances along said cavity until it exits said bolt via said at least one opening in said distal end.

23 A self drilling rock bolt according to claim 22 wherein, two grouting materials discharged from said head mix in said cavity in said bolt prior to exiting via said at least one opening in said

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distal end.

24 A method of insertion of a self drilling rock bolt in a rock strata using a drilling machine to which is attached a drill head; wherein the method comprises the steps of ;

- a) placing said drilling machine in alignment with a location at which a rock bolt is to be inserted;
- b) taking a rock bolt having an internal cavity;
- c) engaging a proximal end of the rock bolt with a support member on said drill head;
- d) advancing the drill head such that a distal end of the bolt engages rock into which the bolt is to be inserted;
- e) rotating the bolt under the action of drive means associated with said head and maintaining an axial force such that the bolt self drills a hole in said rock strata;
- f) during drilling, flushing the hole via the internal cavity of the bolt with a fluid such as water to remove unwanted rock cuttings;
- g) injecting a grouting compound from at least one passage in said head and into the cavity in said bolt;
- h) continuing said injection of said compound at least until said compound exits the cavity in said bolt and enters an opening in the bolt hole between the wall of said hole and the exterior of said bolt.

25 A method according to claim 24 comprising the further step; prior to injecting the compound into the cavity in said bolt, of advancing an injection nozzle into sealing engagement with a proximal end of said bolt thereby allowing direct communication between the passage in said head and the cavity in said bolt

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26 A method according to claim 25 wherein said passage is said passage is in an injection assembly which delivers said grouting material.

27 A method of insertion of a self drilling rock bolt in a rock strata using a drill head capable of attachment to a drilling machine for insertion of a rock bolt into rock strata; wherein the head includes an injection assembly adapted to enable injection of a grouting compound from a passage in the drill head and into a bolt hole via an internal cavity in a rock bolt which communicates with said passage in said drill head when an end of said bolt engages said drill head such that said passage and said internal cavity are substantially in alignment, wherein the method comprises the steps of;

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- a) placing said drilling machine in alignment with a location at which a rock bolt is to be inserted;
 - b) taking a rock bolt having an internal cavity;
 - c) engaging an end of the rock bolt with a member a on said drill head;
 - d) advancing the drill head such that a distal end of the bolt engages rock into which the bolt is to be inserted;
 - e) rotating the bolt under the action of drive means associated with said head and maintaining an axial force such that the bolt self drills a hole in said rock strata;
 - f) during drilling, flushing the hole with a fluid such as water to remove unwanted rock cuttings;
 - g) injecting a grouting compound from at least one passage in said head and into the cavity in said bolt;
 - h) continuing said injection of said compound at least until said compound exits the cavity in said bolt and enters an opening in the bolt hole between the wall of said hole and the

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exterior of said bolt.

28 A method according to claim 27 wherein the injection assembly shuts off flushing fluid flow during injection of said grouting material into said cavity in said bolt.

29 A method of grouting a rock bolt inserted in a rock strata using a drilling machine incorporating a drilling head; wherein the method of grouting comprises the steps of;

- a) after a rock bolt has been placed in situ, advancing an injecting nozzle of an injection assembly incorporated in said head until it reaches sealing engagement with a proximal end of the rock bolt;
- b) injecting a grouting compound from a passage in said injection assembly into an internal cavity in said bolt;
- c) continuing said injection until the grouting compound exits said internal cavity of said bolt and fully occupies a space formed between the exterior of said bolt and the wall of said hole;
- d) retracting said nozzle away from sealing engagement with said bolt.

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